



UNITED STATES PATENT AND TRADEMARK OFFICE

AK

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/874,145	06/05/2001	Yun-Yu Wang	FIS9-1997-0266US4	6641

7590 11/17/2003

Jay H. Anderson
IBM Corporation - Zip 482
2070 Route 52
Hopewell Junction, NY 12533

EXAMINER

NADAV, ORI

ART UNIT PAPER NUMBER

2811

DATE MAILED: 11/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/874,145

Applicant(s)

WANG ET AL.

Examiner

ori nadav

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 September 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) 19-26 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 recites a first layer comprising titanium and being in contact with the substrate, and a second layer overlying the first layer and comprising an element (lines 3-4), wherein the element is in contact with the substrate (lines 9-10). It is unclear how the element can be in contact with the substrate since the first layer is in contact with the substrate and is located between the element and the substrate.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-18, insofar as in compliance with 35 U.S.C. 112, are rejected under 35 U.S.C. 103(a) as being unpatentable over Rathore et al. (6,069,068) in view of Farahani et al. (5,612,253).

Art Unit: 2811

Rathore et al. teach in figure 3 and related text (column 7, line 66 to column 8, line 40) a method comprising:

a) depositing a multilayer structure on a semiconductor substrate, the multilayer structure including a first layer 5 comprising titanium and in contact with the substrate, a second layer 6 overlying the first layer and comprising an element selected from the group consisting of cobalt, tungsten, tantalum, and molybdenum, and a third layer 7 comprising titanium overlying the second layer, in which the amount of the element does not exceed 20 atomic percent of the total amount of the element and titanium present in the multilayer structure, and depositing a conductive material 9 on the structure.

Although Rathore et al. do not explicitly state that the amount of the element does not exceed 20 atomic percent of the total amount of the element and titanium present in the multilayer structure, this feature is inherent in Rathore et al.'s device for the following reason. Rathore et al. teach in figure 3 and related text (column 7, line 66 to column 8, line 40) a multilayer structure including a first layer 5 having a thickness of 100-300A, a second layer 6 having a thickness of 200-400A, and a third layer 7 having a thickness of 100-600A. Since the thickness of the element's layer does not exceed 20 percent of the total thickness the element's layer and the titanium's layers present in the multilayer structure, then the amount of the element does not exceed 20 atomic percent of the total amount of the element and titanium present in the multilayer structure, as claimed.

Art Unit: 2811

Rathore et al. do not teach annealing the substrate and the structure in a nitrogen-containing atmosphere at about 500/C to about 700/C.

Farahani et al. teach annealing the substrate and the structure in a nitrogen-containing atmosphere at about 500/C to about 700/C (column 7, lines 31-40).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to anneal the substrate and the structure in a nitrogen-containing atmosphere at about 500/C to about 700/C, as taught by Farahani et al., in Rathore et al.'s device, in order to improve the adherence of the glue layer to the dielectric.

Regarding the claimed limitations of annealing forms a first silicide layer including the element in contact with the substrate and a second silicide layer including titanium and the element overlying the first silicide layer, these features are inherent in the device of Farahani et al. and Rathore et al., because Farahani et al. and Rathore et al.'s structure is identical to the claimed structure, and the effect of annealing would be similar on both structures.

Regarding claims 2-5, 11-14 and 16-18, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to form the structure at about 16 rim thick, wherein the amount of the element present in the structure is about 5 atomic percent of the total amount of the element and titanium present in the structure, and the annealing is conducted at about 600/C for about 0.5 to 2 hours, in Rathore et al.'s device, in order to optimize the adhesion and the

Art Unit: 2811

effectiveness of the glue layers, by forming it at the required thickness and temperature parameters.

Regarding claims 6-9, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to form the element comprising of cobalt, tungsten, tantalum, and molybdenum in Rathore et al.'s device, in order to use a known alternative conductive material. Note that substitution of materials is not patentable even when the substitution is new and useful. *Safetran Systems Corp. v. Federal Sign & Signal Corp.* (DC NIII, 1981) 215 USPQ 979.

Regarding claim 15, Rathore et al. do not teach a conductive plug being tungsten. Farahani et al. teach a conductive plug being tungsten. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a conductive plug being tungsten in Rathore et al.'s device, in order to use a known alternative conductive plug material. Note that substitution of materials is not patentable even when the substitution is new and useful. *Safetran Systems Corp. v. Federal Sign & Signal Corp.* (DC NIII, 1981) 215 USPQ 979.

Response to Arguments

Applicant argues prior art does not teach that annealing forms a first silicide layer including the element in contact with the substrate and a second silicide layer including titanium and the element overlying the first silicide layer.

Art Unit: 2811

Although prior art does not state that annealing forms a first silicide layer including the element in contact with the substrate and a second silicide layer including titanium and the element overlying the first silicide layer, these features are inherent in the device of Farahani et al. and Rathore et al., because Farahani et al. and Rathore et al.'s structure is identical to the claimed structure, and the effect of annealing would be similar on both structures.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

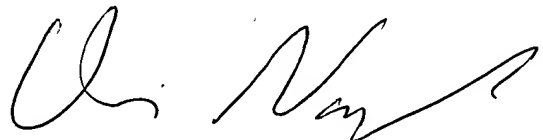
A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Art Unit: 2811

Papers related to this application may be submitted to Technology center (TC) 2800 by facsimile transmission. Papers should be faxed to TC 2800 via the TC 2800 Fax center located in Crystal Plaza 4, room 4-C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The Group 2811 Fax Center number is (703) 308-7722 and 308-7724. The Group 2811 Fax Center is to be used only for papers related to Group 2811 applications.

Any inquiry concerning this communication or any earlier communication from the Examiner should be directed to *Examiner Nadav* whose telephone number is **(703) 308-8138**. The Examiner is in the Office generally between the hours of 7 AM to 4 PM (Eastern Standard Time) Monday through Friday.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Technology Center Receptionists** whose telephone number is **308-0956**

A handwritten signature in black ink, appearing to read 'Ori Nadav', with a stylized flourish at the end.

O.N.
November 4, 2003

ORI NADAV
PATENT EXAMINER
TECHNOLOGY CENTER 2800